United States Patent

Piesche

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[54] APPARATUS FOR THREADING OF FOLDING SHEETS

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[52] **U.S. Cl.**.....**156/91,** 112/214

[51] **Int. Cl.**.....**B32b 7/08**

[58] **Field of Search**.....112/121.16, 121.11, 79 A, 121.15, 112/214, 79 R; 38/2; 156/91, 93, 92, 148

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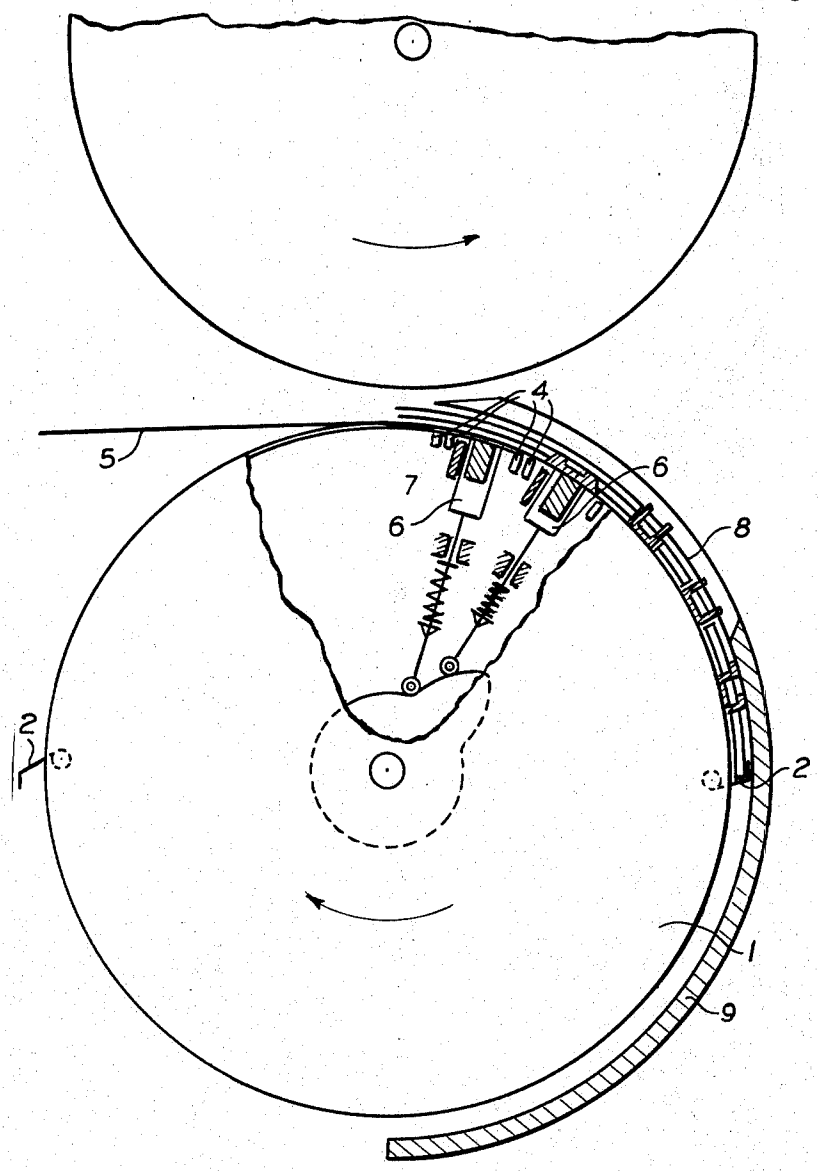
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[57] **ABSTRACT**

A method of and an apparatus for stitching of folded sheets with textile, thermoplastic or impregnated threads, which comprises the steps of accompanying of continuously moved folded sheets for a given stroke of its path by stitching needles disposed perpendicularly to the folded sheets at the same speed and in the same direction. The folded sheets are thereby relatively stationary with respect to the stitching needles during the insertion of ends or loops of threads. The thread ends or loops pass a stationary sealing rail or gluing device and are sealed or glued by the latter.

3 Claims, 4 Drawing Figures



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2 Sheets-Sheet 1

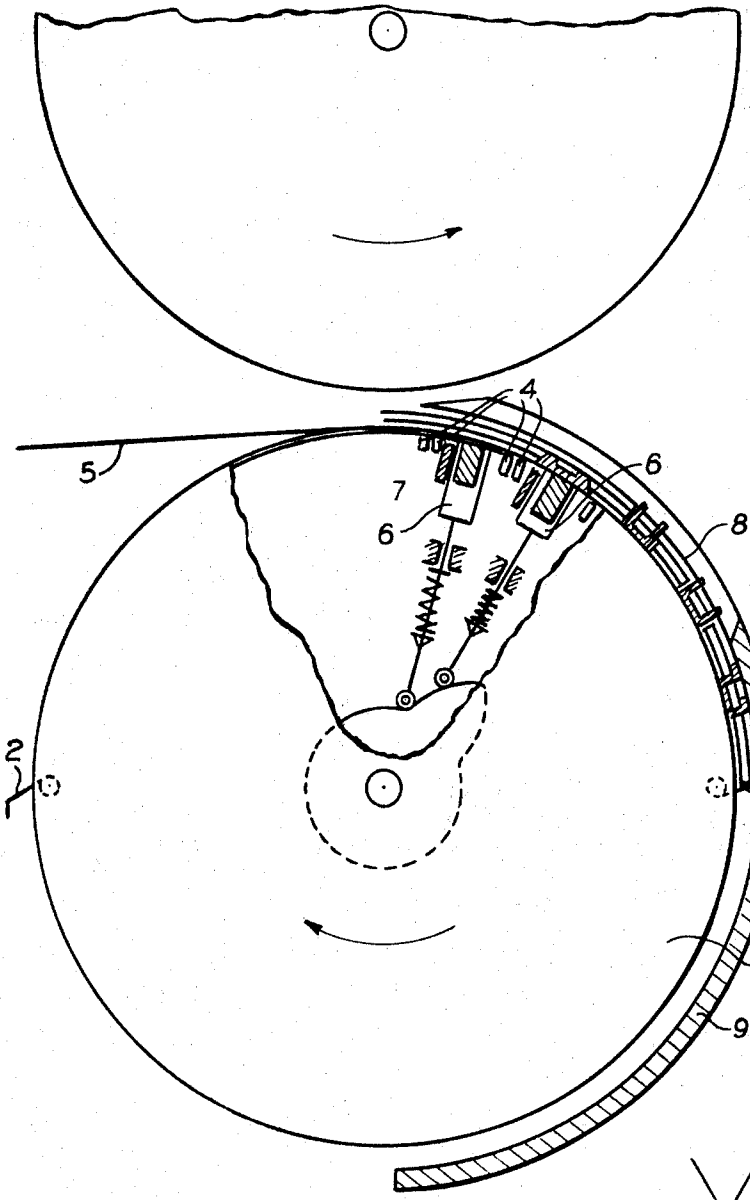


FIG. 1.

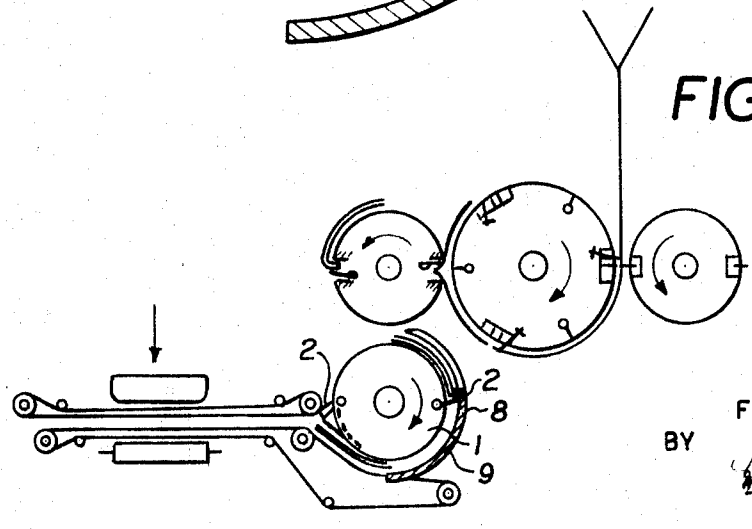


FIG. 2.

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FIG. 4.

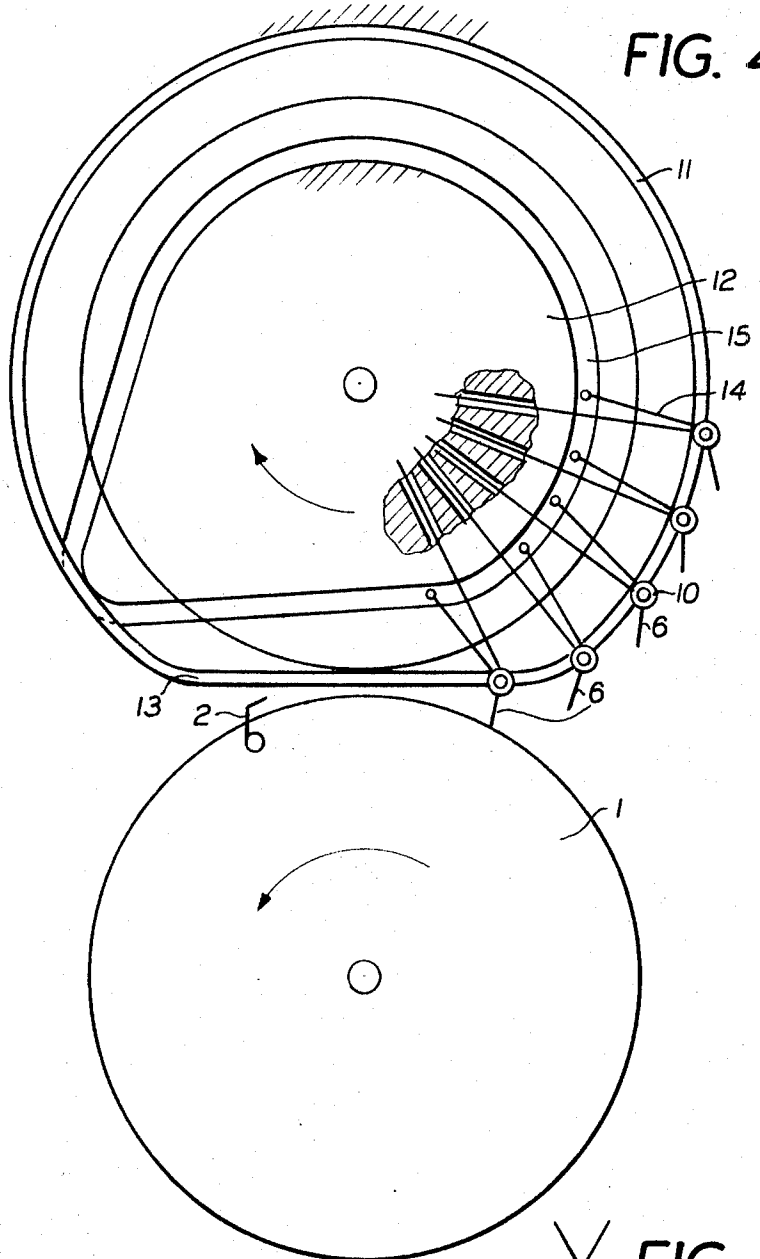
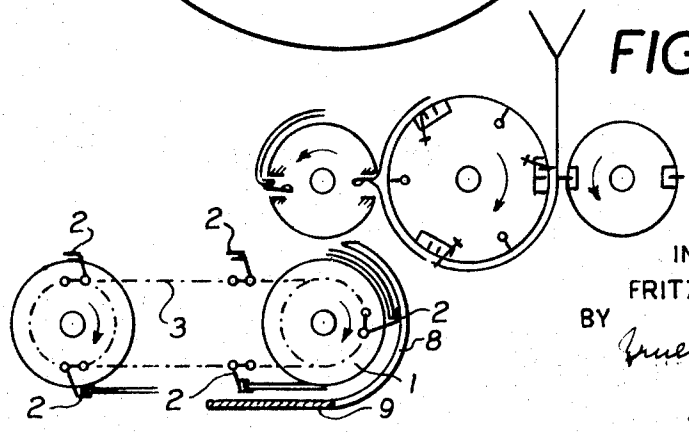


FIG. 3.



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APPARATUS FOR THREADING OF FOLDING SHEETS

The present invention relates to a method of and an apparatus for the stitching of folded sheets with textile, thermoplastic or impregnated thread by bonding or sealing to the folded product.

In high-production rotary web presses it is known to fold the printed sheets by a folding apparatus which is installed at the end of the press. Existing differences in speed between the printing and folding processes, and particularly upon the third and fourth folds, are eliminated by dividing up the stream of products before the effecting of the third or fourth fold, so that at least two of such folding devices must be present in the printing press. The stitching or thread-sealing of the folded sheets emerging from the rotary web press was effected heretofore by means of a separate stitching machine after the folding, since this operation, if it is carried out directly in the rotary press, would require a reduction in the output of the machine or else a further subdivision of the stream of product.

A simple addition of known stitching devices at the folding operation is thus not possible, since in the known stitching devices, the material to be stitched is brought to a standstill for the application of the staples and must then be accelerated again, so that there would be a reduction of the speed of operation as compared with the rotary press.

It has already been provided therefore a device with which the stream of folded sheets emerging from the rotary printing press is divided up and fed over two or more adjacent thread-stitching or sealing devices, in order to be able to stitch without accumulation the folded sheets which arrive in rapid sequence and then apply the last fold. Such arrangements are of high manufacturing cost, since a plurality of stitching devices must always be accommodated to a single rotary press, and, on the other hand, also result in a high susceptibility to disturbance. Furthermore, in these machine arrangements, depending on the number of subsequent stitching or thread-sealing devices, relatively complicated separating devices for the stream of sheets are necessary, as well as for each stitching station a special conveyor belt with precisely operating sheet guide devices, which are also very complicated and expensive. The provision of such a device therefore results not only in considerable expense, but also in a need for an increased amount of space. This is disadvantageous, in particular when stitching or thread-sealing devices are to be attached in the manner described to an existing rotary printing press in a printing plant, although the free place necessary for this is not present.

Another disadvantage resides in the fact, that in the folding apparatus the sheets are transported in exact alignment by precise delivery, but after leaving the printing machine they are left to themselves and must be aligned again only upon entering the sealing or thread-sealing device. Such an increased technical expenditure means considerable costs and is therefore not feasible.

There are furthermore known devices in which the folded sheets are fed on a conveyor belt for the stitching, but are not brought to a standstill, but pass lying flat and continuously through the stitching device, and the stitching is applied by a rotating needle wheel. This device to be sure permits a faster operation, however before the insertion of the stitching thread, the sheets must be aligned in the same way as in the case of the device described above, since they must also be taken over by conveyor belts at the delivery of the web rotary press and fed to the stitching device. On the other hand, the corresponding needle of the needle contacts the material to be stitched, depending upon the speed of operation, only for a brief moment, since there is concerned here a circumferential point contact, so that the needle must move extremely rapidly upon the stitching, in order to avoid a tearing of the stitched sheet. The speed of operation of such a device is therefore very limited and furthermore the needle and thread are subject to very high stresses.

A sealing of the inserted thermoplastic or impregnated threads during their movement would furthermore not be possible with the previously known sealing devices, since in them the ends of the staples are bent outward and are connected by outward sweeping movements of the sealing tools with the folded sheets. When using this device, the thread ends are therefore bonded or glued to the folded sheets, so that only textile threads are used.

In another known device there is also employed a needle wheel with stitching needles arranged on the periphery, which needles, however, are swingable within a predetermined range against the pressure of a tension spring. By this arrangement a result is intended, that the stitching needle pierces perpendicularly into the material to be stitched already a short distance in front of the apex point and leaves the material only after passage of the apex point, so that the stitching process takes place over a greater path. This arrangement has the disadvantage, however, that the distance between a stitching needle located at the apex point and the next following needle is greater at its base, than the distance apart of the holes in the material stitched, so that therefore the following stitching needle jams in the stitching hole, lifts the material being stitched and thereby does not completely pass through it. In this connection, there is also the danger that the stitching holes will be unsuitable widened, since the stitching needles are furthermore also swung within given limits in the stitch hole.

For the reasons mentioned, it was heretofore not possible particularly in the manufacture of books to work with only one thread stitching device, the folded sheets arriving in rapid sequence in a web rotary printing press after the folding or before the last fold.

The advantage of a positive guidance of the sheet on a gripper cylinder for utilization for the stitching could heretofore only be used in the case of a known device for the introduction of wire staples which however result definitely in a lower quality of the product, since wire staples have the disadvantage that upon the subsequent gluing of the back of the book they become moist and rust. Wire staples furthermore have the disadvantage for the manufacture of books, that the back of the book is considerably thicker than the book itself and therefore the further operations encounter technological difficulties. They are also very unsuitable because of their rigidity, since, in contradistinction to a stitching or sealing thread, they do not permit any initial tensioning and therefore rapid loosening of the inner sheet layer is possible.

It is one object of the present invention to provide an apparatus for the stitching of folded sheets which makes it possible, without the use of a plurality of identical stitching devices and without additional space being required, to stitch folded sheets precisely with threads at the speed of any desired folding device.

It is another object of the present invention to provide an apparatus for the stitching of folded sheets which stitches moving folding sheets in the folding apparatus of a rotary printing press or sheets emerging from some other folding device with threads while maintaining them in movement.

It is a further object of the present invention to provide an apparatus for the stitching of folded sheets in which the continuously moved folded sheets are accompanied over a given length of their path by vertical stitching needles at the same speed and in the same direction, so that the folded sheets are relatively at rest with respect to the stitching needles, while the thread ends or else loops pass along a stationary sealing rail or gluing device and are sealed or glued there.

It is still another object of the present invention to provide an apparatus for the carrying out of the method of the present invention, wherein on a given folding device there is arranged a rotating cylinder provided with grippers or a gripper chain, which has on its periphery radially movable stitching needles which introduce cut textile, thermoplastic or impregnated threads by their ends or endless threads with the created resultant continuous thread loops into the material to be stitched and furthermore also has on its periphery radially movable pressure members, which can be controlled such, that during the entire stitching process they press the thread

against the material to be stitched, while the latter on the opposite side first of all passes along a needle plate provided with a longitudinal slot or groove and then past a heatable sealing rail or a gluing device, so that the thread ends or loops are turned over in the direction opposite the movement of the cylinder and then sealed or glued to the material being stitched.

It is still a further object of the present invention to provide another apparatus for carrying out the method of the present invention, which comprises a fixed needle guide member, which has two endless cam grooves and a rotating needle carrier with stitching needles which are arranged swingably on the periphery and the distance between the latter and the folded sheet can be so determined by the one cam, while its position with respect to the folded sheet can be so determined by levers fastened to the stitching needles and having their other ends resting against another cam, that the stitching needles pierce the folded sheet, remain in the hole produced by the piercing over a larger range and in this connection, corresponding to the position or the curvature of the folded sheet are always perpendicular to same.

With these and other objects in view which will become apparent in the following detailed description, the present invention will be clearly understood in connection with the accompanying drawings, in which:

FIG. 1 is a schematic elevation of the device in accordance with the present invention on a gripper drum;

FIG. 2 is a schematic elevation of the device in accordance with the present invention in the folding apparatus of a rotary web printing press;

FIG. 3 is a schematic elevation of the device of the present invention on the rotating cylinder in combination with a gripper chain; and

FIG. 4 is a schematic elevation of the needle guide body with a needle carrier.

Referring now to the drawings, a cylinder 1 is coordinated to the folding blade cylinder of a folding apparatus of a rotary web printing press at a slight distance from the peripheral surface thereof. The cylinder 1 is provided with sheet holding or guiding devices 2 or with a rotating chain 3 having sheet holding or guiding means and furthermore, at any desired place of its longitudinal axis on the periphery with radially movable fed stitching needles 6 which introduce a thermoplastic or impregnated thread 5, held by thread clamps 4 and thereupon cut off and with pressing members 7, which are controlled from the inside of the cylinder 1 by cams or other control members. In the direction of rotation of the cylinder 1 from the apex of the folding blade cylinder with the cylinder 1 there is provided a needle plate 8 which is arranged at a slight distance from the periphery of the cylinder 1 and is provided with a slot which is open at the place of introduction, said plate being associated with the stitching needles 6 and the printing members 7.

As a continuation of the needle plate 8 there extends over a larger part of the periphery of the cylinder 1 a heatable sealing rail 9.

In the case the the cylinder 1 provided with a chain 3, as disclosed in FIG. 3, the sealing rail 9 can be adjusted for any desired direction of movement of the chain 3 and thereby be arranged at any desired place.

The folded sheet resting on the cylindrical surface of the folding blade cylinder is taken over at the apex with the cylinder 1, which moves at the same circumferential speed and in opposite direction of rotation, by the sheet holding or guiding means 2 and fed forward between the moving cylinder 1 and the stationary needle plate 8. During this process, the stitching needles 6, which are radially movable and controllable in the cylinder 1, take over the thread 5, which is introduced between the cylinder 1 and the folded sheet, held fast by the thread clamps 4 and then cut off, and insert it then into the folded sheet which is arranged in relative resting position with respect to the cylinder 1, whereby the centerpiece of these resultant stitch clamps being pressed against the folded sheet by the pressing member 7 which is also radially movable and controllable. Due to the longitudinal slot which extends in the stationary needle plate 8 over several needle spacings or else a longitudinal groove, the stitching needles 6 can remain in the piercing position upon rotation of the cylinder 1, without the stitching needles 6 being damaged or broken off. After the return of the stitching needles 6 to below the surface of the sheet, the thread ends or loops are turned over in the direction opposite the direction of movement at the end of the longitudinal slot or longitudinal groove in the needle plate 8 by the rotary movement of the cylinder and immediately behind same or at some other point of the rotation of the cylinder or of the gripper chain path sealed to the folded sheet in the same manner by passing along the heatable stationary sealing rail 9.

The printing members 7 can be controlled in such a manner that in contradistinction to the stitching needles 6, they press the thread against the folded sheet during the entire stitching and sealing process. The piece of thread which falls off between two folded sheets is removed by a suitable removal device, for instance a suction device or a stripper.

Another device for the carrying out of the method of the present invention consists of a stationary needle guide body 11 and a rotating needle carrier 12 provided with stitching needles 6 arranged swingably on the periphery.

The pivot points 10 of the stitching needles 6 can be displaced radially by means of a cam 13 on the needle guide body 11, so that due to the shape of the cam, they are located over a larger path in the vicinity of the sheet while the stitching needles 6 themselves can be swung by levers 14 which are fastened thereto and the other ends of which travel in another cam 15, so that in the vicinity of the sheet they pierce into same and remain perpendicularly in the pierced hole over a large region.

The advantage of the apparatus in accordance with the present invention resides particularly in its possible universal application on all known folding devices. Furthermore, it is possible in place of the sealing path to provide any desired gluing device for the working of textile threads.

While I have disclosed several embodiments of the present invention, it is to be understood that these embodiments are given by example only and not in a limiting sense.

I claim:

1. A method for thread stitching and sealing folded sheets with threads using rotating, controlled stitching needles comprising the steps of

feeding folded sheets along a rotating circular surface carrying a thread wound off a spool and being clamped on the surface,

cutting the thread to hold thread pieces from a direction inside of the circular surface,

stitching from a direction inside of the circular surface with radially moving retractable stitching needles,

driving the ends of the thread pieces through folded sheets being fed upon the circular surface and forming a clamp of thread,

retracting the stitching needles and then inclining the ends of the thread by a stationary sealing means,

sealing the inclined ends on the surface of the folded sheet, and

feeding out the folded sheet from said circular surface.

2. A device for thread stitching and sealing folded sheets with threads using rotating, controlled stitching needles comprising

a rotating cylinder,

gripper means operatively mounted on said rotating cylinder for feeding a folded sheet around a part of said cylinder, said cylinder having a surface formed with a groove for a thread pulled off a spool,

means disposed within said cylinder for holding the thread within said groove,

means for cutting said thread into thread-pieces into a length of a thread sealing clamp,

said holding means for holding said thread-pieces,

radially moveable stitching needles mounted within said cylinder, and

a stationary cam in the center of said rotating cylinder for moving said stitching needles.

3. An apparatus for stitching of folded sheets with threads, comprising

a rotating cylinder adapted to be applied to any folding device,

said rotating cylinder including,

sheet-holding means,

radially movable stitching needles at its periphery,

radially movable pressing members,

said pressing members terminating at any given point of the periphery of said cylinder over larger part of the circular path of said cylinder with the cylindrical face,

said stitching needles having their tip projecting from their

cylindrical surface,

said folded sheets guided on said cylinder over a further part of the path to a heatable sealing rail,

a stationary needle guide body having two endless cam grooves,

a rotating needle carrier coordinated to said needle guide body and provided on its periphery with swingable stitching needles, and

the distance of the latter from said folded sheet is determined by one of said cam grooves and the vertical position of said stitching needles to said folded sheet within the piercing range is determined by levers fastened to said stitching needles and coordinated to the other of said cam grooves.

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